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EDITORIAL.

SCOPE FOR REFORM.

ALTHOUGH it is, we believe, true that statistics relating to anæsthetic fatalities are even more misleading than most statistics of a similar kind, there does not seem to be valid reason why this defect should be allowed to remain. There are several obvious causes for the little value which can be placed on statistics collected in attempts to determine anæsthetic percentage mortality. In the first place the very term "anæsthetic fatality" is quite differently construed in different quarters. One authority applies it only to the patient who dies on the operating table, another to every patient who dies before recovering consciousness, and a third to all patients dying within three days of the taking of the anæsthetic. A fourth will attempt the impossible task of dissociating completely the effects of illness, operation and anæsthetic, and will count as an anæsthetic fatality only that to which the last cause alone can be assigned. Not only, then, are the data on which statistics are collected by no means constant, but also the methods of collecting them are equally at variance with each other. There is the utmost variety in the way in which records of anæsthetics are kept at various institutions, when, indeed, they are kept at all. And there is a vast waste of useful material involved in the system by which post-mortem examinations of persons dying under anæsthetics are usually made away from the institutions in which they died, and the records of the dead and the living patient are generally irretrievably separated. The kind of loss of knowledge which this system entails has been to-day brought home to us by

the statements of a famous pathologist. He had been struck in several instances by the extensive collapse of lung present in the bodies which he had examined of persons who had died during or after operation. The clinical history, as provided, did not suffice to explain the phenomenon. What was especially needed was a detailed account of the anæsthetic employed and the method by which it was given. The pathologist's opinion was that probably, if the post-mortem phenomena and the anæsthetist's accounts were correlated, a very definite indication of the cause of the condition would be obtained and an important lesson for anæsthetists would be derived. The necessary facts are there. They are separated, dispersed and wasted by a faulty system. The pathologist is not in the position to collect the facts from the anæsthetist's point of view, and the anæsthetist is not aware of the information which the pathologist could supply to him. This is only one example of the way in which useful knowledge is left infertile, instead of being added to the common stock and giving its aid towards improvements in practice and the enhanced safety of anæsthesia. It appears to us that there must be many similar instances. Certainly a definite system of recording anæsthetics, with their immediate and remote results, would, if it could be widely employed, add enormously to the sum of our useful knowledge. An attempt of this kind has, we know, been made in the United States, but we do not know to what extent it has been successful. And it would, we imagine, be even more difficult to carry out in that large country than it should be in Great Britain. May we humbly recommend the idea to the new Association? Doubtless that body will be more than fully occupied with ideas of its own, but when it can spare the time we beg it to cast a favourable eye on the notions suggested in the above lines.

THE CHOICE OF AN ANÆSTHETIC FOR ABDOMINAL SURGERY.

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(Continued from Vol. IX, No. 4, July, 1932.)

Local anæsthesia (spinal anæsthesia excluded) is almost without immediate danger; fatalities caused by the anæsthetic, which are not infrequent with tonsillectomy, etc., are not reported in laparotomies. In my 4,562 operations under local anæsthesia I had only five deaths during operation or shortly after, in spite of the high number of bad risk cases.

One patient died from severe haemorrhage from an eroded mediocolic artery caused by gastro-jejunal ulcer. A woman, 63 years of age, suffering from a fixed rectal cancer, had a severe haemorrhage from the superior hæmorrhoidal artery during sacral operation. Laparotomy was necessary, under ether narcosis (80 cubic centimetres), to ligature the vessel. The patient died from hæmorrhage at the end of the operation. A woman, aged 79 years, who had been suffering for four days from volvulus and gangrene of the ileum, and who was already pulseless before operation, died after it.

Two deaths are connected with the anæsthesia. One of them, caused by overdosage of pantocain for splanchnic anæsthesia, has already been mentioned. The second one was a real shock death which occurred during re-laparotomy for hæmorrhage after stomach resection, when, without mesenteric anæsthesia, a gauze strip was laid upon the gastro-hepatic omentum.

Deaths within the first three to five days (except the cases of peritonitis) are also exceedingly rare (four fatalities, or 0.08 per cent, compared with 2.2 per cent in operations under narcosis). Only one out of four cases (a total extirpation of a cancerous stomach and œsophago-jejunostomy) is a death from operative shock and the greater amount of novocain used (one and a half grains). Deaths from gastro-intestinal atony,

which amount to 0.81 per cent in operations under ether narcosis, are entirely absent in operations under local anæsthesia.

It is of the greatest importance that the mortality from pneumonia has been considerably reduced by local anæthesia. Whilst in my own material mortality in 610 operations under general narcosis amounts to 1.31 per cent, it is only 0.24 per cent in 4,562 operations with local anæsthesia. Even in the 843 patients, who were from 60 to 88 years of age, mortality from pneumonia comes to 0.94 per cent only. In the stomach resections for gastric or duodenal ulcer there is a mortality of 1,23 per cent in operations with ether narcosis (one death in 90 cases); in operations under local anæsthesia, however, the death-rate is only 0.07 per cent (one fatality in 1,408 resections). In 510 operations for gallstones I did not have a death. After local anæsthesia all patients, even those suffering from a pulmonary disease, are given an exceedingly careful after-treatment (regular deep breathing, sufficient expectoration, injections of camphor oil, transpulmin) which is very important for avoiding fatal pneumonia. In contrast to Gottstein's teaching, which is everywhere quoted, it is ascertained from my own material that by local anæsthesia the mortality from pulmonary complications can be considerably reduced.

Nervousness and extreme adiposity, as well as infancy, are generally looked upon as contra-indications to the use of local anæsthesia. In nervous patients I begin, at their demand, with general narcosis. Then I perform an exact local anæsthesia of the abdominal wall and mesenteries, or splanchnic block, and in most cases I can then leave off the narcosis. The usual pre-operative treatment with pantopon-morphine is, in most cases, and even in nervous patients, absolutely sufficient for the operation with local anæsthesia. I have never seen permanent injury from excitement (psychic shock). Patients who suffer from severe Basedow must be treated for this disease before the laparotomy. In extreme adiposity local anæsthesia is difficult, but it is not only not contra-indicated, but it is even very necessary because of the fatty heart, so as to reduce the general narcosis as much as possible. In these cases combined anæsthesia is the safest method. In children

local anæsthesia may also be used with success if narcosis has to be avoided for some diseases (scarlatinal nephritis, pulmonary tuberculosis, acute grippe, etc.) Of 130 children less than 14 years of age suffering from appendicitis 49 could be operated on with local anæsthesia. In all cases of bad risk general narcosis includes high dangers. Moots has calculated an index for operability to estimate the dangers of the narcosis. The formula is:

$$\frac{\text{Pulse pressure}}{\text{Diastolic pressure}} = \text{pressure ratio per cent or index for operability.}$$

When this index is high or deep it signifies danger, when it lies between 30 and 70 the case is operable; below 25 per cent or over 75 per cent it is inoperable. McMechan distinguishes three different groups: (1) Safe: 15 per cent increase in pulse-rate without increase in blood-pressure; or 10 per cent decrease in blood-pressure without a decrease in pulse-rate; (2) Dangerous: 25 per cent increase in pulse-rate plus 10 to 25 per cent decrease in blood-pressure; (3) Shock: a pulse-rate of 100 and rising, with progressively falling blood-pressure reaching a systolic of 80 m.m. and a pulse-pressure of 20 mm. or less. If shock exists for 30 minutes or more during operation without effective remedial measures, death is almost inevitable in 24 to 72 hours.

Before all laparotomies it is useful to give the patient pantopon or morphine with atropine, whether the operation is performed with local anæsthesia or narcosis. My patients get 0.02 pantopon one hour before the operation, 0.01 to 0.02 morphine together with 0.0003 to 0.0005 atropine 15 minutes before the operation. I have not used scopolamin for 20 years, because of its toxicity.

In minor operations (gastrostomy, colostomy, etc.) most surgeons are using local anæsthesia. In appendectomy ether narcosis is the method of choice. Some surgeons use spinal anæsthesia. I myself let the patient choose if he wants narcosis or local anæsthesia, unless he suffers from affection of the apex (though cured completely). Of 513 cases of chronic appendicitis 334 were operated on with local anæs-

thesia only. In 59 some ether was required. In acute appendicitis general narcosis is preferred by most surgeons. If there is already a peritonitis from perforation, the combination of local anæsthesia with some ether, or better still with laughing gas, is to be preferred, because, by it, the already existing intestinal paralysis is not increased as by deep ether narcosis. Results are much better with operations under local anæsthesia. While in 170 operations with narcosis, the cases with diffuse peritonitis included, mortality amounted to 10 per cent, in 346 operations with local anæsthesia it is only two per cent. As long as I performed the operations for diffuse peritonitis under general narcosis I had very bad results (66 per cent mortality), while later under combined anæsthesia with little ether, the mortality became smaller (20 per cent). In the cases with perforation and subsequent localised peritonitis the difference is similar (9.09 per cent mortality in narcosis, 2.38 per cent in local anæsthesia).

In operations for gall-bladder diseases general narcosis is still preferred. With plain cholecystectomies, if the patients are young and demand a narcosis, I begin the operation under general narcosis (at present almost only laughing gas) but in each case I then make a regional anæsthesia of the abdominal wall and an injection of novocain into the hepatoduodenal ligament, or splanchnic anæsthesia. In all other patients the operation is begun under local anæsthesia of the abdominal wall, and a paravertebral (37 cases) or a splanchnic anæsthesia (267 cases) is added. In 89 plain cholecystectomies under general narcosis mortality is relatively high (7.8 per cent), because among the seven fatalities are two deaths from gastro-intestinal atony, whereas in 333 cholecystectomies under local anæsthesia the mortality amounts to 0.6 per cent only. The cases of common duct obstruction are always operated on with local anæsthesia. In spite of the long duration of the obstruction (up to six months), in spite of purulent cholangoitis, in 89 cases mortality could thus be reduced to less than 10 per cent. Fatalities were caused by already existing acute pancreatitis, and by already existing sepsis, but there is no death from insufficiency of the liver, which had caused the high mortality before. It is very interesting that at Adam's

clinic the operative results were better by using local anæsthesia than general narcosis. Among 293 simple cholecystectomies under general narcosis there were two deaths. In 183 operations under local anæsthesia there were no deaths. In cases of complicated cholecystectomies the mortality in 117 operations under general narcosis was much higher (44 per cent) than in 119 cases operated on under local anæsthesia (17 per cent) (Vulkanyi).

In the cases of acute intestinal obstruction, as well as of diffuse peritonitis, the anæsthesia is of great importance to the immediate results. The deep general narcosis, even with ether, lowers the blood-pressure, which is already low on account of the disease and, therefore, easily causes collapse and death at the moment the cause of obstruction is found and removed. The intestinal paralysis already existing is increased by the general narcosis, and the patient cannot be rescued even by injections of pituitrin, neohormonal, etc., after the operation. In spite of this, general narcosis is still most frequently used in our country. Spinal anæsthesia would be the ideal method because it counteracts the intestinal paralysis during the operation. It has, therefore, been recommended by Wagner as a method of treatment in paralytic ileus. At the operation for diffuse peritonitis spinal anæsthesia helps to evacuate the intestine during the operation and thus facilitates operating. Unfortunately it includes immediate danger by fall in blood-pressure, so that Forgue demands that it should be used only in cases which are not heavily damaged. Of the German surgeons 11 only apply spinal anæsthesia for intestinal obstruction.

According to my own experiences, local anæsthesia, combined with a short ether "rausch" at the moment of eventration, is the safest procedure, especially in extremely severe cases of intestinal obstruction that has been existing for a long time, as ether narcosis, in the beginning, raises the blood-pressure and obviates the collapse. Besides, combined anæsthesia as well as spinal anæsthesia does not increase the intestinal atony. Therefore it is astonishing that only in 16 out of 120 answers is this procedure given as the method of choice. In my own material only spinal anæsthesia was used 20 years ago. Since that time, in every case, the abdomen is opened under

local anaesthesia and, at the moment of eventration for searching for obstruction (detorsion of the volvulus, etc.) a short ether "rausch" is applied. The further operation (for example the resection of the intestine) is done under local anæsthesia. As it is the safest method of anæsthesia no case was excluded from operation, even if, on account of bad risk and old age, the operation had been declined by several other surgeons. In all these cases the blood-pressure was raised by injection of pituitrin and by intravenous saline infusion immediately before the operation.

In spite of the great number of quite bad cases in my own material, the mortality is much less than in hospitals where general narcosis is the method of choice. Among 98 cases of acute mechanical obstruction of the intestine (the cases of simple strangulated hernia not included) I have a mortality of 14.2 per cent, whilst Perthes, in 203 cases has 36 per cent; Eiselsberg and Starlinger in 333 cases have 52.9 per cent, and Bier and Hintze in 209 cases have a mortality of 53 per cent. The one-stage resection of colon is at its best when performed for gangrenous volvulus (seven cases, all cured). In the acute obstruction by cancer of the colon the one-stage resection is a mistake (four fatalities in five cases). In these cases the two-stage resection may be performed (seven cases with two deaths); I prefer colostomy (30 cases with two deaths). In the one-stage resection done for gangrene of the small intestine under local anæsthesia the results are better (in 32 cases there were 10 fatalities, i.e. 31.2 per cent) than with general narcosis (Perthes has a mortality of 56 per cent in 18 cases; Eiselsberg 58.5 per cent in 53 cases; Bier 70 per cent in 31 resections). In aged patients the prognosis of intestinal obstruction is not essentially worse than in young ones. Of 46 personal cases, aged between 60 and 86 years, nine cases have died (19.5 per cent mortality). The results of resection of the gangrenous small intestine in aged patients are strikingly good. Of 14 patients, aged between 70 and 81 years, only one woman, 76 years of age, died 24 hours after the resection of nearly the entire strangulated gangreneous small intestine (4 m.). All other cases were cured.

In resection of the stomach general narcosis has been more and more displaced these last years by local anæsthesia

of the abdominal wall and mesenteric anæsthesia (25 surgeons) or by splanchnic anæsthesia (18 surgeons). Also basal hypnosis with avertin (25 surgeons), less frequently with pernocton (four surgeons), has been used. Narcosis with nitrous oxide instead of ether narcosis has been applied by five surgeons. In the resections for cancer of the stomach I have been using, for the last ten years, nearly exclusively splanchnic anæsthesia (273 cases), and only four times has some ether had to be added. Mesenteric anæsthesia was used 148 times. In 38 of these cases small quantities of ether (up to 50 cubic centimetres), in 19 cases more than 100 cubic centimetres of ether, had to be given also. That local anæsthesia reduces the mortality of resection of cancer is generally acknowledged and this fact is expressly emphasized by some surgeons (Olivier, Pauchet, Tanyuchi, etc.). The mortality also depends, of course, upon the invasion by cancer of the neighbouring organs. In spite of a wide-minded indication (65 per cent of all cases of cancer were radically operated on by me) in simple resections of the stomach I have reduced the mortality to 8.4 per cent in 271 resections, while the mortality, under general narcosis, is still 20 to 30 per cent. The cancer invading the colon, pancreas or the liver, is declared as inoperable by most surgeons. For a long time it has been my standpoint to operate radically on all these cases, in spite of their higher mortality for pancreatitis, peritonitis, etc. (in 153 resections the mortality was 41 per cent). Still 30.4 per cent were permanently cured even of the most advanced stages of cancer.

In resection of the stomach for ulcer the results in my material are considerably worse when operated on with general narcosis than with local anæsthesia, not only in the plain resection of ulcer (90 resections under general narcosis with 12 fatalities, equal to 13.3 per cent, compared to 1,240 resections under local anaesthesia with 40 deaths, equal to 3.2 per cent), but also in the radical operation for gastro-jejunal ulcer, i.e. for ulcer of the duodenum that had not been cured by gastro-enterostomy (in 32 operations under general narcosis there were six deaths, 18.7 per cent; in 136 operations with local anæsthesia there were nine deaths, a mortality of 6.6 per cent). The higher mortality in operations with general narcosis is

caused by seven deaths from shock, which never occurred in local anæsthesia, and by more frequent peritonitis (4.4 per cent in narcosis and 1.4 per cent in local anæsthesia). The superiority of local anæsthesia to general narcosis is most distinctly shown by the fact that out of 134 patients, aged between 60 and 78 years, who had all been operated on under local anæsthesia, three patients died (2.2 per cent), whilst the mortality in the 1,196 younger patients, who had been operated on under general narcosis, is 4.1 per cent.

In acute profuse hæmorrhage from ulcer the operative treatment has only been successful since narcosis has been left off. In early operation, that is, within 24 to 48 hours after the onset of the acute symptoms, resection, as the most secure measure to arrest hæmorrhage, may still be performed with the same good results as an ordinary resection for ulcer. Above all, aged patients, in whom the danger of death from hæmorrhage, because of their arterio-sclerosis, is exceedingly great can be operated on with success. Of 39 resections there was one fatality only (a mortality of 2.5 per cent).

A man, aged 80 years, suffered from the stomach for 40 years. Prior to operation he had frequent vomiting and his weight dropped to 34 kilograms. Gastro-enterestomy was performed. The night before the operation there was serious collapse which was taken for a heart collapse by the attending physician. The following morning lavage of the stomach showed fresh blood (the stomach reached the pelvis). The pulse-rate was 130 and was quite weak. Laparotomy was performed immediately under local anæsthesia, with 0.25 per cent solution of novocain. Puncture of the stomach evacuated four litres of bloody liquid. A large ulcer of the lesser curvature, penetrating into the pancreas, which had caused the hæmorrhage, and an obstructing pyloric ulcer were found. A typical resection, instead of a gastro-enterostomy was necessary. The pulse-rate, after the operation, was 136, the following day it was 100, and the third day the temperature was normal, 80. The course of healing was absolutely without reaction. Eight days later, when the patient was out of bed, he became chilled and developed a bilateral pneumonia and died the 10th day after operation.

In late operations, when the patients had at first been attended by the internists and are only sent for operation when the bleeding from a great vessel of a penetrating ulcer cannot be arrested, the mortality, naturally, is much higher.

Of 42 resections 13 died, equal to 31 per cent. The mortality, however, lessens, to 22.5 per cent, as six patients, in spite of the complete arrest of the bleeding died within the first three weeks from other diseases (recurring dysentery, coma diabeticum, uremia in a case complicated with a common duct obstruction for six weeks, sepsis from gangrenous appendicitis which had not been radically operated on, two cases of perforation of acute bleeding ulcer in the abdominal cavity before the operation).

In resection of the colon general narcosis is still regarded as the method of choice; some surgeons operate under spinal anæsthesia. I myself now exclusively operate with local anæsthesia and apply when mobilising the fixed parts of the large intestine (colon ascendens, colon descendens) either a short ether "rausch" or para-vetebral anæsthesia. The exclusion of a deep general narcosis has the great advantage that I have sufficient time to make the intestinal suture so exact that with side-to-side anastomosis no leakage need be feared. (To-date I have had no death from leakage of the suture). Besides, no post-anæsthetic intestinal atony has been observed sufficient to cause leakage of the circular intestinal suture by overdilatation. With local anæsthesia the results of the operation can be considerably improved. If the bowel is sufficiently evacuated the one-stage resection of the left colon can be performed. In resection of the colon for tuberculosis, megacolon, colitis, etc., the results of the one-stage resection are good (97 resections with three fatalities, 3.1 per cent). Also in the operation for cancer the one-stage resection even of the left side of the colon may be done if the bowel is empty. I have in 41 one-stage resections a mortality of 11.9 per cent; whilst Nordmann reports a mortality of 28 per cent with general narcosis. If, in cancer, the bowel can no longer be evacuated, or when an acute obstruction already exists, I now operate in three stages: (1) colostomy; (2) resection with side-to-side anastomosis; (3) closing of the colostomy. In these operations also the mortality is 11.5 per cent in 26 cases. In this way I could still operate with success on highly advanced cases, which had already been refused as inoperable by other surgeons who operate under general anæsthesia.

Eighteen years ago I operated on a man, aged 64 years, in whom, 10 months previously, a cæcostomy had been performed by another surgeon for intestinal obstruction from cancer of the colon descendens, presumed to be inoperable. When I resected under paravertebral anæsthesia, the tumour (histologically: scirrhus) had already reached three times its former size. After the third operation (closing of the colostomy) the patient made a complete recovery. To-day he is 82 years old and absolutely healthy.

Twelve years ago I resected in a severely emaciated man, aged 62 years, a cancer of the sigmoid flexure (histologically: adeno-carcinoma) which was fixed in the fossa iliaca to the common iliac artery. Because of the risk all the surgeons of Budapest and two Viennese surgeons had refused the radical operation. In this case I had to operate in four stages: (1) transversostomy, (2) resection of the colon and sewing the intestinal ends into the abdominal walls, (3) resection of the artificial anus, (4) closing of the transversostomy. The four operations were all executed under local anæsthesia. The patient is absolutely cured after 12 years.

The abdomino-sacral resection of a high-located cancer of the rectum is, owing to its danger (mortality 30 to 50 per cent), only rarely performed, and, if so, under general narcosis. The causes of death are shock and infection of the wound. Spinal anæsthesia can avert the fatalities from shock, but its drawback is the short duration of the insensibility. Until 1922 I performed that operation also under general narcosis, with a mortality of 31 per cent. Since then I have operated under combined parasacral anæsthesia, which is certainly not always sufficient by itself (in 76 cases 39 times only). Mortality could thus be restricted to 15.7 per cent in 57 cases, though aged patients were not excluded from the operation (15 patients aged between 60 and 75 years).

Conclusion.

Cholorform should no longer be used in laparotomies, because of its immediate dangers and, above all, because of its late injuries. Ether narcosis is still the most used method of anæsthetizing. It has less immediate dangers, but it damages the parenchymatous organs and the circulation in prolonged narcosis, and leads to death through insufficiency of the organs (so-called shock deaths) if they had already been injured by disease. In rare cases ether narcosis causes fatal

gastro-intestinal atony. By damaging the normal protective ferments it favours the onset of peritonitis and pneumonia. Narcosis with nitrous oxide is technically more difficult, but it has less immediate dangers and almost no late injuries; therefore it is to be preferred in major operations. For the better relaxation of the abdominal wall it can be usefully combined with local anæsthesia. Avertin and pernocton have the great advantage of excluding the patient's psyche before the operation, but even as basal hypnotics they are not harmless, especially in severely toxic general conditions.

Local anæsthesia as an anæsthesia of the abdominal walls and the mesenteries is harmless if the right doses are administered. It allows every operation on mobile organs. In fixed organs it must temporarily be combined with a general narcosis. In all major operations, even if begun under general narcosis, a local anæsthesia of the abdominal wall and a mesenteric anæsthesia are advantageously added, for thus much of the general anæsthetic may be spared and every operative shock avoided.

Splanchnic anæsthesia can be used in all operations in the upper abdomen (operations on stomach and gall bladder). In more than 90 per cent it produces absolute painlessness, and is, in exact technique and in right dosage, nearly without danger. It is especially indicated when a general narcosis in support of the mesenteric anæsthesia is not advisable.

Paravertebral anæsthesia is indicated only in these operations, in which the injection of one side is sufficient (operations on the gall-bladder, resections of the large intestine), and if any narcosis, even combined, is to be avoided.

Parasacral anæsthesia, combined with a block of the hypogastric plexus, grants a sufficient anæsthesia for all hypogastric operations (abdomino-sacral operations for cancer of the rectum; all gynæcological laparotomies). It is less dangerous than spinal anæsthesia and lasts longer. Its administration, however, is more difficult and disagreeable than spinal anæsthesia. High spinal anæsthesia is used by only a few surgeons because of its immediate danger. Until these risks are lessened by improved technique, splanchnic anæsthesia is to be preferred in epigastric operations.

No form of local anæsthesia injures either circulation or

parenchymatous organs, nor does it destroy the normal protective ferments of the organism; therefore, deaths from so-called operative shock and from gastro-intestinal atony are not observed and fatal peritonitis is rarer. Most important of all, however, the number of fatal pneumonias can be reduced by the use of local anæsthesia so that the results of operations with local anæsthesia are much better than with general narcosis.

The choice of an anæsthetic will always be individual and depend not only on the condition of the patient but also on the surgeon's preference for some method of anæsthetizing. The supreme principle must be: highest possible safety for the patient. Every surgeon will choose for his patient only that anæsthesia which in a given case he believes to be the least dangerous and which, therefore, he would permit to be used on himself and on his nearest relations.

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NOTES ON ANÆSTHESIA IN THORACIC SURGERY.*

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There are few surgical patients who are more dependent on the anæsthetic agent and the method of its administration for their immediate and remote safety than the subjects of serious intrathoracic disease. During anæsthesia for thoracic surgery, complications may arise to endanger the life of the patient, and they may actually defeat all the resources of the anæsthetist and of the surgeon unless precautionary measures have been undertaken to anticipate them.

The following examples are quoted from experience and the cause of death in each type of case was verified in the post-mortem room.

1. A sudden, accidental and unexpected pneumo-thorax may precipitate collapse of the lung, flapping of the mediastinum and an alarming or fatal collapse of the patient.

2. The rupture of a lung abscess into a bronchus or a bronchiole, or the occurrence of hæmorrhage from the wall of the abscess cavity or from the surrounding lung tissue during an operation, may drown the patient by the passage of fluid into the trachea and thence into the bronchus of the sound lung.

3. The compression of a cavernous lung which actually occurs during the operation of thoracoplasty, and more especially after the operation, may force fluid or viscid material into the bronchioles and into the trachea. The suction action of the sound lung during inspiration, which is

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especially marked after an effort at expulsion, may draw the material from the trachea into its bronchus, producing asphyxia and heart failure.

The end results of such cases depend on two factors:—

(a) The general vitality and the respiratory capacity of the patient.

(b) The efficiency of the methods adopted to cope with them.

As a class, patients with intrathoracic disease present to the anæsthetist a set of circumstances of the worst type for general anæsthesia. They are frequently the subjects of long standing toxæmia and malnutrition, with a low resistance to loss of blood and surgical trauma. This is especially true in patients undergoing the operation of thoracoplasty, which is carried out with a view to the relief or cure of such conditions as pulmonary tuberculosis, bronchiectasis, abscess of the lung and chronic empyema.

It is generally recognized that the risk of opening the pleural cavity and the urgent necessity for positive intrapulmonary pressure to protect the patient against this risk have both been exaggerated.

None the less, surgeons, physicians and anæsthetists of wide experience are of opinion that in the surgery of the thorax and mediastinum, including simple acute empyema, some form of differential intrapulmonary pressure facilitates the operation, reduces surgical shock and protects the patient both on the table and against post-operative complications.

The ideal anæsthetic agent and the method of its administration for thoracic surgery should insure the patient:

1. An easy induction and an even maintenance of anæsthesia without excessive respiratory effort.

2. The absence of anoxæmia and toxæmia.

3. That positive intrapulmonary pressure can be produced and maintained at will.

4. That the action of the anæsthetic agent will cease with its administration.

5. That adequate facilities for pulmonary aspiration are provided.

The only anæsthetic agents which approach this standard are nitrous oxide gas and ethylene gas, either of which will

make an easy first choice. Ethylene has important advantages over nitrous oxide. It is a more powerful anæsthetic agent and will give surgical anæsthesia with a higher percentage of oxygen than may be used with nitrous oxide. Unfortunately, ethylene gas is explosive, has an obnoxious odour and excites more post-anæsthetic sickness, factors which have retarded its progressive use as an anæsthetic agent.

The following anæesthetic procedure has been adopted in adults for the operation of thoracoplasty for pulmonary tuberculosis.

An $\frac{1}{8}$–$\frac{1}{6}$ gr. of morphine sulphate with $\frac{1}{150}$ gr. of atropine sulphate is given hypodermically 90 minutes before the time of operation and the same dose is repeated 45 minutes before operation. In some cases heroin appears to suit the patient better and replaces the morphia, or omnopon gr. $\frac{1}{3}$ with scopolamine gr. $\frac{1}{300}$ is administered hypodermically 90 minutes before operation and repeated 45 minutes later. The patient is instructed by position and by cough to endeavour to empty the pulmonary system of sputum or of any accumulated secretion before coming to the theatre, but the result is frequently disappointing. Anæsthesia is induced with gas and oxygen as soon as the patient is comfortably settled on the operation table. Nitrous oxide 95 per cent with oxygen 5 per cent is used for the purpose. The expiratory valve is kept open during the first 5—6 respirations so as to get rid of the pulmonary air. The oxygen, from the commencement, relieves the respiratory distress which these patients suffer during the early part of the induction, and if the pulmonary air is rapidly replaced by the anæsthetic gas the induction period is shorter and easier and marked by the absence of respiratory spasm, cough, anoxæmia and jactitation.

The patient is now turned on the sound side and the operation field is infiltrated with $\frac{1}{2}$ per cent novocain and adrenalin. It requires ten minutes for the full benefit of novocain to develop and the protection afforded to the patient against shock and hæmorrhage will be greater, the more thoroughly the infiltration is carried out and the longer the interval allowed between the injection of the novocain and the commencement of the operation. On that account it is

good practice, in selected cases with placid temperament, to infiltrate the operation area with ½ per cent novocain before commencing the general anæsthetic and to block the intercostal nerves in all cases with 1 per cent novocain after the operation field has been exposed.

An artificial airway may be passed over the tongue and the facepiece is fixed with Clausen's harness. It is important that the artificial airway should not reach the pharyngeal mucous membrane as the pharyngeal reflex and the cough reflex are not intended to be absent. The head is flexed and lowered to facilitate the operative procedure on the upper ribs. Any expectoration that occurs during the induction or the maintenance of anæsthesia is safely accommodated in the dependent cheek and is aspirated by means of the suction apparatus, when convenient. Sufficient oxygen is supplied to prevent undue anoxæmia and capillary hæmorrhage. This is not always easy since the whole or part of one lung may be out of action and the percentage of oxygen required to avoid anoxæmia may render quite impossible such a saturation of the blood and of the tissues with nitrous oxide as will maintain surgical anæsthesia. It is this factor of anoxæmia that frequently makes it necessary to add a trace of ether to the nitrous oxide and oxygen. The addition of a small percentage of ether does less harm than continued anoxæmia. Rebreathing is continued for the most part throughout the operation and the gas bag is kept distended with the mixture of gases to the extent of five to seven mm. Hg.

A positive intrapulmonary pressure of five to seven mm. Hg. is sufficient to prevent collapse of the lung if the pleural cavity is accidentally opened, and it stimulates the reinflation of the lung tissue after the evacuation of pus in empyema thoracis.

The closed method of anæsthesia with gas bag and facepiece tends to retard the passage outwards of any fluids that reach the respiratory passages from the operation field and to force them into the sound lung. So that this form of anæsthesia does not, in my opinion, adequately protect patients undergoing thoracoplasty for abscess of the lung or for bronchiectasis; neither does it properly safeguard the patient in surgical procedures for lobectomy or mediastinal

tumour. In such cases there is a definite risk of pus or blood or accumulated secretion reaching the tachea, or that one or both pleural cavities may be invaded, and endotracheal anæsthesia is more likely to insure the safety of the patient and the success of the operation because it combines a positive intrapulmonary pressure with a constant outward current and a free exit. Two catheters, open at both ends and with lateral apertures at the distal end, should be used and the return airway catheter serves for aspiration purposes if and when an emergency arises. The larger catheter may be retained in the trachea for aspiration, at intervals or in emergency, during several hours after the operation. If the cough reflex remained active throughout the operation the patient would be able to evacuate any material that reached the main bronchus and the trachea, but thoracoplasty, for example, inflicts considerable loss of blood and surgical trauma on a patient with low vitality and as a result the cough reflex, along with other reflexes, may be only weakly present or actually obliterated before the close of the operation and for several hours afterwards. Bronchoscopy and aspiration, before and after operation, might occasionally serve the purpose, but the use of bronchoscopy and aspiration is not generally favoured by thoracic surgeons and physicians in these cases.

In some American clinics intrapharyngeal insufflation of nitrous oxide, oxygen and ether through the nose, under pressure, is favoured for thoracic surgery. It is stated that a positive intrapulmonary pressure can be induced and maintained, as and when desired, by this simple method of administration and that pharyngeal aspiration may be continued throughout the operation.

The conclusion is that in cases of major thoracic surgery, including simple acute empyema, where the respiratory vital capacity is reduced or where the lung is not bound to the chest wall by adhesions and there is a risk of acute pneumothorax, or where there is a possibility of pus or blood or accumulated secretions flooding the respiratory system, it is important for the safety of the patient that the administration of the anæsthetic should include some form of differential

intrapulmonary pressure and that an adequate system of pulmonary aspiration should be in operation.

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300 CASES OF ROUTINE SPINAL ANÆSTHESIA.

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IN recent years, following the introduction of the so-called "light solutions," spinal anæsthesia has deservedly become more popular. It has been used in various forms at the General Hospital, Nottingham, since 1910, but never found great favour until 1930 when the first batch of Duracaine* was tried out.

During 1931, prompted by the dictum of Finsterer,[1] that "The chief dangers of every major operation are due to general anæsthesia and its harmful results" a determined effort was made on one of the Surgical Sections, to try and reduce ether narcosis to a minimum. This was done partly by the use of local and splanchic anæsthesia, and partly by giving an intrathecal injection as a routine for all suitable cases.

During the year over three hundred spinal anæsthetics were given. Commencing in February with only five administrations, the range of usefulness was gradually extended, until in December out of 48 operations 33 were performed under this kind of anæsthesia.

No cases of radium administration have been included in this paper owing to the alleged liability of the element to produce post-operative complications, notably vomiting; but apart from these the records of 300 consecutive cases have been investigated.

Among them the notes of eight were found to be incomplete, and in fifteen one of the percaine solutions had been used.

These latter cases have not been included, as it is not the purpose of these few notes to compare the relative merits of

* Manufactured by May & Baker.

solutions for spinal administration, nor would it be possible with such small numbers. Suffice it to say that among the radium-percaine and incomplete record cases there has been no untoward accident attributable to the anæsthetic.

The remaining 277 cases of routine anæsthesia with duracaine have been analysed and form the basis of this communication.

Type of Case.

Of this number, 41 males and 59 females were suffering from acute conditions necessitating an emergency operation without full pre-operative preparation. The majority of these were, as might be expected, cases of acute appendicitis, but included among them are a number of all types of abdominal catastrophe, from strangulated herniæ to perforated diverticulitis.

In addition there were six maternity cases. Three Cæsarean section, a Cæsarean hysterectomy for ruptured uterus, and two instrumental deliveries. In these cases the powerful contraction of the uterus after delivery was a pleasing feature.

Included among the other 177 cases have been all types of operations below the costal margin, from partial gastrectomy to ligation of haemorrhoids. The youngest patient in the series was No. 19, aet 12—acute appendicitis; and the oldest, No. 61, aet 79—strangulated femoral hernia. Both made good recoveries.

Two chief contra-indications to spinal anæsthesia have been observed in the later cases.

1. Cases where the systolic blood pressure was less than 100 mm. of mercury, and (2) very nervous patients. One patient refused operation without a general anæsthetic.

Administration.

In order to use this kind of anæsthesia as a routine, a simple procedure is essential, otherwise the proceedings become too cumbersome for a long list of operations.

In the earlier cases various methods of administration were tested, with the constant aim in view of simplifying the procedure.

Special needles and tiltometers[2] have been abandoned, and such extras as measurement of the spine,[3] and repeated estimations of the blood pressure, considered essential by some writers, have not been employed. Barbotage was found to delay the action of the drug and has been discarded. We now adopt the following procedure. In all cases a dose of morphia is given hypodermically half an hour before the time of the operation. The patient is placed in the left lateral position. The space between the second and third lumbar vertebræ is selected and a solution of ephedrin and planocain injected at the chosen site, infiltrating the path of the needle down to the theca. The ephedrin combats the fall in blood pressure[4] and the planocain renders the actual puncture practically painless.

A No. 19 S.W.G. lumbar puncture needle is then introduced in the mid-line, and after aspirating a few drops of cerebro-spinal fluid, the appropriate dose of duracaine is injected, and the patient turned on to his face.

The gentle upward slope of the vertebral column from the site of injection to about the sixth thoracic vertebra, is next confirmed. If necessary, this can be made more definite by placing a pillow under the chest, with the head at a lower level. The patient is then turned on to his back and, provided the head is kept low, no Trendelenburg position is necessary for the average case. Anæsthesia usually develops in three to five minutes from the time of the injection.

Much has been written about the need for careful management of the patient during the operation—suffice it to say here, that our experience fully endorses the importance of Psych anæsthesia.[5]

Dosage.

Duration of anæsthesia is largely governed by the quantity of the solution employed, and by the extent to which it is distributed. The level it reaches is regulated by the time the patient is in the ventral decubitus. This statement is made as a result of practical experience, though other views on the matter have been expressed elsewhere.[6]

The maximum amount of duracaine used in this series was

5 c.c. and the minimum 1 c.c. The average dose for adult males was 2.5 c.c. and for females 2.3 c.c. The usual quantities we now employ are as follows: For operations below Poupart's ligament 1.5 c.c., followed by 1 minute face-downward position: for lower abdominal work such as appendicectomy, 2 c.c. and 2 minutes and for upper abdominal surgery such as cholecystectomy, 2.5 to 3 c.c. with 13 minutes turned on the face. Administrations on this scale produce anæsthesia lasting from 60 to 80 minutes. Percaine was used for operations requiring a very long anæsthetic. A smaller amount of the solution is needed for patients suffering from prolonged toxic absorption—a fact which has been emphasized by Sebrechts.[7]

Failures.

In this series there were 19 failures, but it is only fair to mention that the majority of them occurred among the earlier applications. Analysis of those cases where success was not attained shows that they fall into four different groups.

Group 1. Seven cases in which after an interval of 15 minutes, adequate anæsthesia was not forthcoming and a second dose was given. A good result attended this procedure in every case, and no ill effect was afterwards observed.

Group 2. Five cases in which the anæsthetic wore off, and general anæsthesia was needed to complete the operation.

Group 3. Four cases in which the level reached was not sufficiently high and general anæsthesia was necessary.

Group 4. Three cases where we were unable to introduce a needle into the spinal theca.

Those gastric operations, in which temporary administration of gas and oxygen was employed during manipulation of the stomach, have not been classed as failures.

The failures in groups 1 and 3 are probably attributable to two factors. (a) The position of the patient. These groups include early cases where the lateral and dorsal[8] positions were on trial. The general adoption of the ventral decubitus[3] has resulted in a marked improvement in the number of successful administrations. (b) The site of the puncture. If the space selected is between the fourth and fifth vertebræ, it may happen that in the ventral position, the third lumbar

vertebra is the lowest point of the lumbar curve, and therefore the solution gravitates towards the sacrum rather than towards the thorax. This we thought explained two of the failures in group 1.

Disadvantages and Complications.

These have been very fully dealt with by Dickson Wright[9] and others; only a few of the special points of interest are considered here.

1. *Disadvantages during the operation.*

(*a*) *Vomiting or Nausea.* This occurred in a number of cases where high anæsthesia was obtained. It was fairly constant in time of onset, usually coming on about 15 minutes after the injection. This unpleasant period passes off rapidly as a rule, and may be checked to some extent by a few deep inspirations, or the administration of a small quantity of oxygen. Important factors in prophylaxis are, care in lifting or turning the patient after the anæsthetic has been given, and gentle manipulation of the viscera during the operation.

(*b*) *Large fall in blood pressure and collapse.* This occurred in three cases, and was successfully met by the administration of pituitrin followed by an intravenous saline.

Case No. 138. *Female aged* 29. Evacuation of uterus for incomplete abortion. Rather shocked from hæmorrhage. Operation under 1.5 c.c. of duracaine. Made good recovery.

Case No. 173. *Male aged* 71. Strangulated inguinal hernia. Admitted in poor condition. Fæculent vomiting. Operation under 1.5 c.c. of duracaine. Improved for a time but died on third day.

Case No. 177. *Male aged* 47. Perforation of large gastric ulcer. Condition poor. Operation under 2 c.c. of duracaine. Recovered after a stormy convalescence.

(*c*) *Postural Discomfort.* This may be a very real trouble during a long operation. The patient's hands are best placed flat on the upper part of the chest with elbows to the sides. A thick rubber mattress does much to diminish the unpleasant hardness of the operating table, but in the lateral position as used for nephrectomy, a good deal of care is needed to make

the patient comfortable. On the whole the high Trendelenburg position is not well tolerated, and some additional gas and oxygen may be needed.

2. *Complications following operation.*

(*a*). *Headache.* Eight patients complained of headache after operation. In five of these cases the pain was not severe and had entirely disappeared within 12 hours. The remaining three had very severe headaches only relieved by large doses of morphia.

Case No. 140. Female aged 28. Dilation and curettage under 2 c.c. of duracaine. Duration of headache, 60 hours.

Case No. 155. Female aged 17. Operation for osteomyelitis of os calcis under 2 c.c. duracaine. Duration of headache, 72 hours.

Case No. 182. Male aged 22. Removal of internal semilunar cartilage under 1.5 c.c. of duracaine. Duration of headache, 60 hours.

It will be seen that in each case the dosage was small, and the operation comparatively trivial.

Two patients complained of headache before operation but not subsequently. Both were suffering from acute appendicitis.

(*b*) *Vomiting.* This must obviously depend on several factors; such as the height of anæsthesia, and amount of upper abdominal manipulation. Table "A" shows the results of investigation of this complication in 260 cases. The

TABLE "A."

Incidence of post-operative vomiting in 260 cases.

	167 Routine operations.		93 Emergency operations.	
	F.	M.	F.	M.
Number vomiting after return to ward	39	23	25	10
,, affected temporarily ...	22	16	16	8
,, affected up to 18 hours ...	13	5	6	1
,, suffering from severe vomiting	4	2	3	1

incidence was much higher among the female patients:—out of 128 cases, 64 were affected, whereas only 33 of 132 males

were similarly troubled It is of interest to note that the percentage of those vomiting was very similar (about 37), whether the patients had a full pre-operative preparation or were emergency cases. A total of 35 out of 93 of the latter being noted and 62 of the 167 cases comprising the former class.

We are of opinion that post-operative vomiting is less in evidence after spinal than after general anæsthesia, and that this is most noticeable among unprepared patients; who in this series show only a slightly higher incidence of this complication.

(*c*) *Chest.* This incidence of post-operative chest complications is shown in Table " B." The figures include some cases where a spinal appeared to us to be the anæsthetic of

TABLE "B."

Incidence of post-operative chest complications in 260 cases.

	F.	M.
Total number of chest complications	8	15
Cough with slight pyrexia	5	10
Definite pneumonic symptoms	2	3
Deaths from pneumonic chest complications ...	1	2

choice, due to existing pulmonary conditions. In a series of cases of strangulated hernia, reduced under various forms of anæsthetic, reviewed by Frankau,[10] the incidence of pulmonary complications after ether almost exactly corresponded with the general incidence. It would appear that careful nursing and the use of carbon dioxide is just as necessary after spinal administrations as after other forms of anæsthesia.

Spinal anæsthesia has been commended for obese patients with ventral hernias,[11] but our experience with these cases has not been favourable. On the whole, fat subjects do not seem to tolerate the recumbent position well, and probably a local anæsthetic, with the table in a modified Fowler position, is mose suitable for these patients.

(*d*) *Ileus.* There were two cases of paralytic ileus.

Case No. 168. Female aged 36. Operation under 2 c.c. duracaine. Gangrenous appendix removed, closed without

drainage. Ileus developed on the fourth day. Died on the seventh day.

Case No. 236. Male aged 66. Prostatectomy by Freyer's me'hod under 2 c.c. of duracaine. Developed ileus on the third day. Great improvement followed the therapeutic administration of a spinal anæsthetic and pituitrin on the fourth day. Died on the eighth day.

(*e*) *Other complications.* Contrary to the experience of some authors, catheterization has seldom been necessary:—only twice in 134 male patients. There have been no cases of ocular palsies, disseminated encephalo-myelitis[12] or other nervous sequelæ, up to the time of writing. One case of acute gastric dilatation occurred following appendicectomy. This was successfully treated by lavage and posture.

Advantages.

It is an accepted fact that post-operative shock is greatly diminished by spinal anæsthesia, and this renders possible such extensive procedures as radical extirpation of glands in cases of malignant testicle, which formerly were considered scarcely justifiable owing to the high immediate mortality.

The wonderful relaxation of the abdominal wall makes the surgeon's task easier, and the comparative fitness of the patients on their return to the wards is greatly appreciated by the nursing staff; particularly where a number of operations have been performed.

The use of the method and dosage described results in one other benefit, namely, the comparatively short duration of anæsthesia. This enables the patient to be propped up fairly soon after returning to the ward; a decided advantage in such cases as peritonitis or perforated ulcer, where a prolonged period of recumbency while "coming round," might conceivably aid the formation of sub-phrenic abscess. There has been no example of this complication in the cases reviewed here.

Repeated administrations do not appear to be contra-indicated. In eight cases the patient was anæsthetized by this method on two or more occasions without mishap. For example:—

Case No. 247. Female aged 33. Carcinoma of rectum.

18. 11. 31. Preliminary exploration and colostomy.

16. 12. 31. First stage of abdomino-perineal resection (Coffey).

26. 12. 31. Second stage of Coffey's operation. Last seen 19. 5. 32. fit and well.

Diminution of hæemorrhage during operation is usually due to marked lowering of the blood pressure, and has not been frequently observed.

Mortality.

Out of the 277 cases analysed there were 24 deaths. This figure at first seems rather high, but the majority of them were very poor surgical risks, and in some the condition was so desperate, that if only a general anæsthetic had been available, no operation would have been undertaken.

Apart from the two cases of ileus already mentioned there were six cases of general peritonitis, seven cases of acute intestinal obstruction, in two of which resection was necessary, and one case of acute hæmorrhagic pancreatitis. Among the others were two cases of pulmonary embolus, one on the twenty-first day, one uræmia, and two cases of advanced carcinoma of pancreas, where a cholecyst-gastrostomy was done to relieve irritation.

The three cases dying from chest complications (c.f. Table B) were :—

1. No. 135. Male aged 78. Strangulated hernia.
2. No. 274. Male aged 30. Acute osteomyelitis.
3. No. 284. Female aged 32. Cæsarean section for severe hæmorrhage with placenta prævia.

A post-mortem was performed in almost every instance and in no case was death, in our opinion, attributable to the anæsthetic.

Conclusions.

It is difficult to draw conclusions from a small number of cases, but I should like to draw attention to the following points :

1. No serious disadvantage was found in using spinal anæsthesia as a routine in 300 cases.

2. The anæsthetic can be repeated without danger.

3. A smaller dose should be given to patients suffering from toxic absorption.

4. In emergency operations on patients not specially prepared, there is less vomiting than after general anæsthesia.

5. By the simple method described a comparatively short duration of anæsthesia can be obtained, which makes possible the adoption of the Fowler position soon after return to the ward.

6. The remarkable diminution of post-operative shock after spinal anæsthesia has long been recognized; but the well-being of the patients, and air of peace in a surgical ward on " list " days, following the use of this anæsthetic as a routine, has yet to be fully appreciated.

7. Spinal anæsthesia does not prove an effectual preventative against such post-operative complications as pneumonia and paralytic ileus.

I am greatly indebted to Mr W. F. Neil, Hon. Surgeon to the Hospital, for permission to publish these cases, all of which were under his care: for the opportunity afforded me to anæsthetize a large number of them, and for his encouragement and instruction.

I wish also to thank Dr Ian Spark, Honorary Anæsthetist, for anæsthetizing a number of the patients and for much help and advice.

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COMMENTS ON THE USE OF PERCAINE AS A SPINAL ANÆSTHETIC.

By E. F. JOHNSON, M.B. (Lond.).

Anæsthetist to St. George's Hospital.

I HAVE been administering percaine as a spinal anæsthetic for the past twelve months, employing the method originated by Dr. Howard Jones and described by him, and have formed the following impressions of its use.

The advantages claimed for it are:—

(*a*) The complete degree of anæsthesia.
(*b*) The admirable muscular relaxation obtained.
(*c*) The avoidance of primary surgical shock, due presumably to the blocking of afferent impulses at the spinal nerve roots.
(*d*) The slight and transient fall in blood pressure which follows its administration.
(*e*) The absence of untoward after-effects.

With regard to these claims it has been my experience that if a suitable dosage is employed, complete abdominal anæsthesia can be obtained except in operations involving traction on the stomach and gall bladder. Pulling on these organs appears apt to set up vagal reflexes which cause the conscious patient a sensation of nausea and efforts at retching, which disappear under gas and oxygen anæsthesia, or as soon as traction is stopped, as for instance when the clamps in a gastroenterostomy have been adjusted. Apart from this, any surgical procedure is possible without the patient experiencing any sensation.

(*b*) If the anæsthetic has been correctly administered, muscular relaxation is complete.

(*c*) and (*d*) Apart from initial fall in blood pressure, which in only one case exceeded 20 mm. in the systolic pressure, and which only lasts for from 15 to 20 minutes,

shock is never observed, and it is the rule for patients to leave the operating theatre after operations such as Wertheim's hysterectomy or arthrodesis of the hip, lasting one hour or more, with a pulse of 70 to 80 and the systolic blood pressure within 10 mm. of its original figure.

(*e*) In a series of 60 cases, only two have suffered from "spinal headache," one lasting two to three days and one 36 hours. The occurrence of these headaches would seem to be minimised by the use of a small bore (1.1 mm.) spinal needle, thereby reducing the liability of subsequent leakage of the cerebro-spinal fluid through the hole pierced in the spinal theca. No case in the series suffered from any form of subsequent paralysis.

In the earlier cases 1/1,500 solution of ordinary percaine was used, and one complete and one partial failure were observed. These appeared to be due to the extreme sensitiveness of the very dilute solution of percaine to the presence of any trace of alkali, for immediately the precaution was taken to wash out the syringe and needle used in faintly acidulated sterile water no more failures occurred. For the past eight months the same strength solution of "buffered" percaine has been used and this does not appear to be unduly sensitive to the presence of alkali, so the above precaution can be omitted.

In the earlier cases, 0.5 to 1.5 c.c. of ephedrine HCl were administered intramuscularly at the commencement of the anæsthetic, but this appeared to be unnecessary, and in one or two cases the surgeon complained of capillary oozing which may have been attributable to the ephedrine. It is now not given unless the general condition of the patient makes it desirable.

In the more recent cases it has been usual either to give a preliminary injection of morphine gr. $\frac{1}{4}$ or to combine gas and oxygen anæsthesia with the spinal anæsthetic, as without either of these the patients are usually extremely conscious of all that is going on around them, and it is obviously desirable to allay their mental apprehensions and dislike of the bodily exposure involved in most operations—especially such as perineorraphies, etc.

In conclusion, spinal percaine appears to be particularly indicated in operations below the diaphragm where some general complication such as lung trouble or diabetes exists, or where the operation may be expected to be lengthy or productive of considerable shock.

THE ASSOCIATION OF ANÆSTHETISTS OF GREAT BRITAIN AND IRELAND.

The Association, as we prognosticated in our last issue, was duly constituted at a well attended meeting which took place at the London Clinic on the evening of July 1st, and we understand that the first General Meeting is to be called for Friday, October 28th. In the meantime the provisionally elected Council has been hard at work, and a number of rules and regulations have been drawn up, after full discussion, for presenting to the first General Meeting. A great deal of time and trouble has been necessary to carry through smoothly and successfully all the necessary preliminary work which the promotion of a body like this requires, and we feel that all anæsthetists will recognize how much they are indebted to the exertions of the nominated President, Dr. H. V. Featherstone, of the secretary, Dr. Howard-Jones, and of the treasurer, Dr. Z. Mennell.

Brief notices of the formation of the Association and its officials have appeared in the medical journals, and the *Lancet* of September 3rd, devoted a short but encouraging leading article to the matter. For the present the membership of the Association is limited to 150, of which number about 100 have so far been enrolled. When the general meeting has confirmed the rules and regulations, and has finally elected the first Council and Officers of the Society we propose to publish detailed information in a future number. At present we can only offer the Association our best wishes for its future prosperity and congratulate its promoters on their excellent start and with its hopeful augury for a long and useful career.

ABSTRACTS

Studies in status lymphaticus and its relation to anæsthetic death. W. W. KEMP. *Anæsthsia and Analgesia.* May and June, 1932.

In the Pacific north-west status lymphaticus is a well-recognised and not infrequent condition. Several authorities there regard it as more common than mastoid disease or appendicitis in children. The author describes the clinical and experimental facts associated with the appearances known as status lymphaticus, and advances an explanation for the phenomena. Briefly this is that in patients so affected there is a deficiency of the adrenal cortex and the hypertrophy of thymus and lymphoid tissues is a compensatory effort to counterbalance this defect. "The lymphatic glands and the thyrothymic apparatus attempt to compensate for the lack of adrenal secretion and the consequent toxaemia that this lack inspires. Hence, the enlarged thymus, far from being a cause of status lymphaticus, is a compensatory hyperplasia on the part of the thymus defence mechanism." The experimental work described certainly supports the author's theory in a striking manner, although the clinical evidence is less convincing.

A new procedure for obstetrical analgesia. H. H. ROSENFELD and R. B. DAVID. *New England Journ. Med.*, Aug. 25th, p. 366).

The authors' method is to combine the use of the newer barbiturates with rectal administration of paraldehyde. They claim :

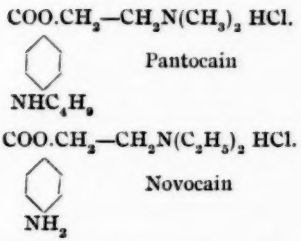
1. Production of a prolonged amnesia and analgesia.
2. Freedom from danger to mother or foetus.
3. Reduction of excitement to a minimum.
4. Avoidance of delay in labour.
5. Simplicity of administration.

Sodium amytal or nembutal in large doses produce rapid and prolonged sleep throughout labour, but both are accompanied by various degrees of excitation in the patient which militate against the complete desirability of these drugs even though the infant remains unaffected, labour not prolonged and the amnesia excellent. If morphia or pantopon are used to control the excitement the infant's breathing is affected. The excitement is not controlled if the barbiturates are combined with scopolamine. The patients, moreover, resist violently if it becomes necessary to supplement the analgesia by ether or gas-oxygen. A combination of drugs is needed which would augment the action of the barbiturate and reduce excitement without delaying labour or endangering mother or child. Fifty cases treated by paraldehyde with barbiturate demonstrate that, so far as a small

number can be regarded as a guide, we have here the desired combination. The procedure adopted is as follows :— If the patient is in active labour she is given seven and a half grammes of nembutal. This produces sleep in from 10 to 15 minutes. If contractions are weak but troublesome we substitute six grains of sodium amytal, because nembutal may stop labour if it is not well established, whereas the sodium amytal has no such effect. If nembutal is used it is followed in from 15 minutes to half an hour by rectal instillation of four to six drachms of paraldehyde in one and a half ounces of olive oil. If sodium amytal is used as the initial dose and labour continues, then four and a half grammes of nembutal are given in one hour, followed by the rectal mixture in 15 minutes or half an hour. If labour is definitely established this procedure can be instituted regardless of the dilatation of the cervix or the height of the presenting part. Within three or four minutes of running in the paraldehyde its odour becomes perceptible in the patient's breath. She quickly falls into a deep sleep, although she moves from side to side during uterine contractions. Labour goes on unabated, and in the majority of cases no further medication has been needed till the presenting part appears in the perineum when gas-oxygen is administered. About five or six hours usually elapse before the patient shows signs of awakening. If the examination, made early in labour, shows that several hours will still be needed for its completion, two to four drachms of paraldehyde in one ounce of oil, with one and a half to three grains of nembutal are instilled into the rectum. There were 30 primiparæ and 20 multiparæ in the authors' series. The average length of labour for the multiparæ was five hours and twenty minutes. The average length of amnesia after labour was eight hours. There were no failures. Twenty-eight patients showed very slight restlessness, moaning slightly with pains. Forty-five of the babies breathed or cried directly after delivery, five required mild resuscitation. The odour of paraldehyde could be detected in the infant's breath for 24 to 48 hours after birth. During the 12 hours of drowsiness following the birth the patients awoke to take nourishment, falling asleep again rapidly afterwards, thus escaping the usual discomforts of the first 12 hours after delivery. In several cases where labour lasted from 10 to 22 hours paraldehyde and nembutal were repeated once or more often without any ill effect on mother or child. The amounts of paraldehyde used varied between four and ten drachms, of nembutal between six and eleven and a half grains

Pantocain in spinal anæsthesia. F. W. MARTIN. *New England Journ Med.*, Aug. 25th, p. 368.

Pantocain is a new anæsthetic drug recently synthetized in Germany. Clinically it belongs to the Novocain series, being butyl-benzoic acid-B-dimethyl-amino-ethyl-ester-mono-hydrochloride.



The new drug consists of small colourless, odourless crystals which dissolve fairly easily in water. The solution is neutral in reaction and very resistant both to heat and cold. Experiments were carried out to test the toxicity, optimal dose and duration of effect. These revealed it is a safe drug with a duration of effect two or three times as great as that of novocain, and a toxicity three or four times less than that of percaine. Clinically it has been employed for spinal work in 581 cases at the Mayo Clinic during 1931. The author has used it in over 100 cases for endothecal infection without a fatality. The blood-pressure is not affected more than it is by novocain. The operations lasted in some instances as long as two and a half hours. No post-operative pulmonary troubles have yet been met and headaches were only slight.

High spinal anæsthesia. G. Falkner Hill. *Lancet,* July 9th, p. 71.

The author describes the technique with which he has been well satisfied in 100 cases, 79 of which required a high analgesia. In no instance did the analgesia last less than one hour. The solution used consists of:

Planocain (novocain) 0.1 gr. per c.c., gliadin, 0.00325 gr. per c.c., glycerin 0.12 gr. per c.c., in 15 per cent alcohol.

The specific gravity is 1.028, i.e., exactly the same as that of ordinary stovaine glucose. A flat table with a nice adjustment is necessary, so that the body of the patient, who lies on the side, can be sloped gently. The interval between second and third lumbar spines is closed and enough cerebrospinal fluid withdrawn to make the contents of the syringe up to 4 c.c. which is then gently injected. As a rule the patient is analgesic to the nipple in three to five minutes. The analgesia does not extend beyond the first or second dorsal segment. There was in no instance any evidence of respiratory embarrassment and blood-pressure was never much affected unless by the operative manipulations. A high anæsthesia does not necessarily cause a low blood-pressure. This is because the solution being heavier than the cerebrospinal fluid affects the posterior roots more than the anterior, from which spring the vaso-constrictor fibres.

The advantages over novocain are that there is much less diffusion

with the heavy solution and the vomiting centre is not affected. Probably absorption as well as diffusion is lessened by the gliadin in the solution. Over stovaine is has the advantage of more gradual action, less toxic effect and quicker elimination, and over percaine probably the advantage of less toxicity. The solution fails in one particular only—it cannot reach the third, fourth and fifth cervical roots and attack the vagus. The author has sought to diminish the action of the vagus by atropine but is unable to say what effect, if any, the drug has on the afferent branches.

Respiratory failure treated by endotracheal insufflation. GILBERT BROWN. *Med. Journ. of Australia.* April 23rd, 1932, p. 81.

The author gives details of five cases in which passing an endotracheal catheter was instrumental in restoring suspended respiration. His method, in the absence of a laryngoscope, is to draw the tongue forward by forceps and pass the index and middle fiingers over it till the epiglottis is felt. This is held forward, and a gum elastic catheter, slightly bent at a point one and a quarter inches from the tip, is passed along the middle finger and inserted between the vocal chords. The catheter is then joined up by rubber tubing with the endotracheal ether machine or with a cylinder of oxygen, or better, of oxygen and carbon dioxide. In this way the lungs are quickly aerated provided that the heart has not stopped beating. The cases included a cut throat, a depressed fracture of the skull and a cerebral tumour, and one in which œdema of the glottis followed extirpation of an epithelioma and cervical glands.

Recent researches and clinical advances in avertin narcosis. VON SEBENING. *Anæsthesia and Analgesia,* July and August, p. 143.

Investigating the absorption of avertin the author shows that the injection never reaches the small intestine although the height to to which it traverses the large bowel varies greatly. Sometimes the cæcum is reached and even filled, at other the injection scarcely gets beyond the rectum. The rate of absorption also varies and is influenced by the rate at which the injection is made. The narcotic effect depends on the rapid rise of the absorption curve in the beginning, which is an expression of the rapidity of absorption, and is not dependent on the final absolute height of the curve. In a patient with incomplete anæsthesia the amount of decrease of avertin in the first 20 minutes was only 32 per cent, in spite of higher dosage and in spite of the final height of the curve. In complete anæsthesia there is a decrease of 50 per cent of avertin in the same period though the dose was smaller and the fluid determination showed a less complete absorption. The narcotic effect depends on the rapidity of absorption in the first 20 to 30 minutes and this depends, among other things, on the amount of mucous surface reached

by the injection. In direct relation with the rapidity of absorption is the increase in the avertin content of the bleed. The rapidity with which avertin diffuses from the blood into the tissues and the rapidy with which it is detoxicated are the two factors acting in opposition to rapidity of absorption, the blood content representing the resultant of these opposing forces. The author describes experimental evidence proving the detoxication of avertin by the liver in animals, and shows by the results obtained in patients with colostomy, when comparisons were possible between injections of avertin into the rectum or into the blood direct and doses given by the mouth, that the same is true of the human beings. There is uniformity of the sleeping time in various types of disease. For instance patients with goitre and toxic goitre show very rapid detoxication, the average sleeping time being only one to two hours. On the contrary in patients with slow or decreased metabolism there is prolongation of the detoxication. Thus obese and asthenic patients have a longer sleeping time, and in cases of cachexia and septic disease there is extraordinary prolongation of the time needed for detoxication. A number of experiments were carried out on rabbits to determine the distribution of avertin in the tissues. These showed the extraordinary prevalence of avertin in the brain, where in all stages of anæsthesia the content was much greater than in other tissues. After 20 minutes the content of the brain was double that in the blood, showing the peculiar absorbtive election of brain tissues for the drug.

Obituary.

WE regret to announce that Dr. Harold Low, late senior anæsthetist to St. Thomas's Hospital and anæsthetist to the royal household, died on July 26th at his residence at Stoke Park. In his earlier days Low had been anæsthetist to the National Dental Hospital, and to the West End hospital for women's diseases. He had been educated privately and at Gonville and Cains, Cambridge, and at the time of his death was Chairman of the London Committee of the Settlement run by that college in Battersea. We are indebted to a former colleague of Dr. Low's for the following notes:—

Harold Low was appointed Junior Anæsthetist at St. Thomas's Hospital in 1895, in the days when anæsthetists were comparative rarities.

He had been taught by Walter Tyrell, one of the pioneers, and as Tyrell's junior for some years he did the greater part of the anæsthetic work at St. Thomas's, and to a great extent it was due to his influence that the great advancement of anæsthetics at St. Thomas's occurred during the end of the last century and the first year or two of this.

Low had an abhorrence of machinery and always held that it was the man behind the mask and not the apparatus that counted. To the end of his days he remained loyal to the drop bottle and open mask and at rare intervals used a Clover to give "gas and ether." He had no use for many of the modern methods, and when one saw him at work and realised how well his patients were after operations this attitude was not altogether surprising.

Many stories are current at his hospital of his power of repartee to surgeons who complained of the lightness of his anæsthesia, and their complaints left him unmoved. The surgeons recognised Low's personality, skill, and the safety of the patients, and took in good part from him what they would have resented from a smaller man.

At one time he did a very large anæsthetic practice, and before the war he was selected to give the late Duchess of Connaught anæsthetics for her two serious abdominal operations. It was soon after this that he was appointed anæsthetist to the royal household.

During the war he was Captain R.A.M.C.T., and was attached to many of the temporary hospitals in London, and to the 5th London General.

Low had personality and a large circle of friends, and as a bachelor he was in great request. He was a prominent member of the United Hospital's Club and other dining clubs: he was always a man to sit next at dinner. He was of a very kindly disposition and generous in an unostentatious manner—a great reader and well informed on many subjects. He played golf, played a fair game and never lost his temper over it: otherwise he was rather of a sedentary nature.

Late in life he married, resigned his hospital before reaching the age limit and retired.

The hospital lost sight of him until his last illness, when he returned seriously ill, and it was with real regret that his friends there realised that the end was not far off.

REVIEWS.

"Recent advances in Anæsthesia and Analgesia," by C. LANGTON HEWER, M.B., B.S. (Lond.), pp. 187 with 64 illustrations, price 12/6; J. and A. Churchill, London, 1932.

This small book summarises in most effective fashion all recent developments of theory and practice in anæsthetics. Dr. Hewer has wisely taken for granted a knowledge of the broad general principles of the practice of anæsthetics and of the routine and older methods of administration. In this account of all the newer methods be displays that clearness and precision which comes only from a thorough study and from wide personal experience of the matters under consideration. The book, indeed, may be taken as a first-rate manual of the most recent anæsthetic methods. This is not to say that these methods are always to be preferred to those which are simpler and less mechanical. There are conditions in which the latter may still be best. For example, operations for acute intestinal obstruction are, in the opinion of many not best accomplished either by endotracheal or by spinal methods, but by short simple old-fashioned inhalation with special positional precautions. However, in most departments of operative surgery the new methods are a great improvement on the old. Thyroid surgery and intra-thoracic surgery and the surgery of the upper abdomen perhaps, exhibit best this new advance; and these three kinds of operation are especially well dealt with by Dr. Hewer. In considering primary cardiac failure Dr. Hewer states that it is "often associated with light anæsthesia." This we beg leave to question; at any rate the statement does not agree with my own experience. Another trifling disagreement in views we find when the author attributes the squint which not very infrequently follows spinal injection to a toxic origin. This explanation does not, we think, fit the facts, and is less likely than that usually offered of involvement in the action of the anæsthetic of the sixth nerve somewhere between its cells of origin and its periphery. There are, however, very few things in this work, even in matters of detail, with which we are not in entire agreement and that we believe will be the view of all those most competent to judge who read the work. It is an excellent performance on which we congratulate the author and the publishers.